WHAT IS CLAIMED IS:

1. A semiconductor device comprising:

a semiconductor substrate;

source/drain regions provided in the semiconductor substrate;

a gate insulating film provided on a channel region between the source/drain regions;

a gate electrode provided on the gate insulating film;

a conductive layer of a metal silicide provided on the gate electrode and the source/drain regions;

an insulating film containing carbon provided on the semiconductor substrate so as to be in contact with at least the conductive layer; and

an interlayer insulating film provided on the semiconductor substrate so as to cover the insulating film containing carbon.

2. The semiconductor device according to claim 1, wherein the insulating film containing carbon is mainly composed of a silicon nitride film.

3. The semiconductor device according to claim 2, wherein a content of the carbon is 1×10^{20} cm^{-3} or more.

4. The semiconductor device according to claim 1, wherein a metal of the metal silicide is nickel.

5. The semiconductor device according to claim 1, wherein a metal of the meal silicide is at least one

selected from a group consisting of tantalum, cobalt, titanium, molybdenum, hafnium, tungsten, platinum and palladium.

6. The semiconductor device according to claim 5, wherein a metal of the metal silicide has a stacked structure composed of a plurality of layers.

7. The semiconductor device according to claim 1, wherein the insulating film containing carbon contains chlorine at a concentration of 4×10^{21} cm^{-3} or less.

8. The semiconductor device according to claim 1, wherein the insulating film containing carbon contains hydrogen at a concentration of 1×10^{20} cm^{-3} or more.

9. A method of manufacturing a semiconductor device, comprising:

forming source/drain regions in a silicon semiconductor substrate;

forming a gate insulating film on a channel region between the source/drain regions;

forming a gate electrode of polysilicon on the gate insulating film;

forming a conductive layer of a metal on the semiconductor substrate so as to cover the gate electrode and the source/drain regions;

heat-treating the conductive layer to form a conductive metal silicide, obtained by a reaction of the silicon and the polysilicon with the metal, on the source/drain regions and the gate electrode;

removing the metal unreacted with the silicon and the polysilicon;

forming an insulating film containing carbon on the semiconductor substrate so as to cover the conductive layer of a metal silicide; and

forming an interlayer insulating film over the semiconductor substrate so as to cover the insulating film containing carbon.

10. The method of manufacturing the semiconductor device according to claim 9, wherein the insulating film containing carbon is mainly composed of a silicon nitride film.

11. The method of manufacturing the semiconductor device according to claim 9, wherein a content of the carbon is 1×10^{20} cm^{-3} or more.

12. The method of manufacturing the semiconductor device according to claim 9, wherein the metal is nickel.

13. The method of manufacturing the semiconductor device according to claim 9, wherein the metal is at least one selected from a group consisting of tantalum, cobalt, titanium, molybdenum, hafnium, tungsten, platinum and palladium.

14. The method of manufacturing the semiconductor device according to claim 13, wherein the metal has a stacked structure composed of a plurality of layers.

15. The method of manufacturing the semiconductor

device according to claim 9, wherein the insulating film containing carbon contains chlorine at a concentration of 4×10^{21} cm^{-3} or less.

16. The method of manufacturing the semiconductor device according to claim 9, wherein the insulating film containing carbon contains hydrogen at a concentration of 1×10^{20} cm^{-3} or more.

17. The method of manufacturing the semiconductor device according to claim 10, wherein the insulating film mainly composed of the silicon nitride film is formed by a reaction of silane having a methyl group or an amino group with ammonia.

18. The method of manufacturing the semiconductor device according to claim 17, wherein the insulating film mainly composed of the silicon nitride film is formed by a reaction of hexamethyldisilane with ammonia.

19. The method of manufacturing the semiconductor device according to claim 10, wherein the insulating film mainly composed of the silicon nitride film is formed by a reaction of hexamethyldisilane and hexachlorodisilane with ammonia.

20. The method of manufacturing the semiconductor device according to claim 10, wherein a film forming temperature in the reaction is 700°C or less.